

tinued the treatment on their subsequent cases.

In the matter of future possibilities it is improvement in technic and apparatus which will give improvement in results. The Coolidge tube is a great help. That is a tube in which the current depends not upon a variable amount of gas in the tube, but upon the incandescence of a filament which can be maintained at a given point indefinitely.

The General Electric Company is now working on a tube of this type which will back up a 20" spark. The gamma radiation of radium corresponds roughly to a 15" or 17" spark. With the perfection of such a tube, the results of Roentgen treatment in all fields should be tremendously increased.

THE CONSERVATIVE TREATMENT OF FRACTURES OF THE LONG BONES AND OF WOUNDS COMPLICATING THEM—A PAPER IN ORTHOPEDIC SURGERY.

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San Francisco.

(Continued from Page 237, June Issue, 1916)

PHYSIOLOGIC USE WITHOUT OVERWEIGHTING.

All surgeons are agreed that physiologic use is the best agent in assisting to make union solid. With fractures of the lower extremity it is good practice to let the patient walk as early as possible with a protecting brace or splint such as a Thomas caliper cut so long that the patient's heel just clears the ground. In certain cases a Hessing or a plaster of paris sheath splint may be employed. Other cases of malunion may be consequent upon a too imperfect reduction of a fracture or upon failure to maintain the parts in good position after a fracture has been reduced. Usually these commoner forms of malunion may be prevented by anticipating them in the setting.

It is always to be remembered that tenderness at the seat of a fracture means the callus is still soft and yielding. Not infrequently the patient complains that the deformity is growing worse.

If the callus will yield in one direction under one set of strains, it can be made to yield in another and opposite direction under another set of strains. Therefore not infrequently by either appropriate splinting or balancing or by actually re-breaking and again setting a limb, the deformity consequent upon malunion may be overcome.

THE CLAVICLE.

Fractures of the clavicle are often the result of direct violence, the blow being usually a shattering one. I have had occasion to cut down on a number of them, frequently to find that instead of a clean break I had to do with three fragments. Unless firm union is obtained such fractures may become the cause of much discomfort. As a rule patients recover with some deformity. The immediate end of treatment is to keep the shoulder well back and out. This assures proper alignment. The Sayre adhesive plaster dressing can be made to accomplish this. It is not comfortable, however. By far the most comfortable dressing is a combined plaster of paris cuirass and shoulder spica.

THE HUMERUS.

For fractures of either the anatomical or the surgical neck of the humerus Bigelow's dictum issued in 1844, "Pad in the axilla. Arm at the side. Hand in a sling," may usually be accepted. Especially is this so in old persons where the fracture is impacted. In those instances where the X-ray shows marked deformity, the upper fragment being displaced outward, an attempt at manipulative reduction should be made. To do this an assistant should make vigorous traction downward on the hand, then, without relaxing his pull, outward; and finally upward. The pull should be sufficient to separate the fragments. The surgeon then with one hand in the axilla and one on the arm can cause the rough surfaces to engage. Care should be taken that when they do this the lower fragment is rotated out sufficiently to permit the hand to be placed on the back of the head.

In accordance with the surgical principle that a fracture near a joint should be immobilized in that position which is ordinarily attained with the greatest difficulty, where there is a fracture of the sort just considered one would naturally fix the arm in the extreme of abduction and elevation with moderate external rotation. This is Dr. Whitman's procedure and was the one employed heretofore by the writer. Mr. Jones advises, however, that after the bones have engaged the arm should be gently brought to the side and immobilized in the usual way.

Fracture of the shaft of the humerus may be complicated by injury to the musculo-spiral nerve, or by the inclusion of this nerve in the callus. In such an event to operate is the only alternative. I have had only one such case. The most efficient dressing I have employed was a plaster of paris spica applied to the shoulder, the arm and the forearm, the latter being flexed to a right angle. While the splint is being applied, downward traction should be maintained on the arm by means of a loop of bandage passed around the flexed forearm and held by the operator's foot so as to prevent overriding of the fragments.

THE ELBOW JOINT.

Fractures of the olecranon should be immobilized in full extension. With this exception all injuries about the elbow joint should be put up in supination and extreme flexion.

In this way the coronoid process is made to fill up the coronoid fossa, thus keeping it clear of callus, while the tendon of the triceps forms a sling about the broken parts holding them together. The flexion is maintained by an adhesive strap surrounding forearm and arm and the limb is suspended from the patient's neck by a bandage round the wrist.

I have in the past two years treated nine elbow fractures in this way with functionally perfect results. All except one were in children. In one other case flexion occurred at the site of fracture. Here an incision was made over the external condyle and the gloved finger introduced into the wound and behind the fracture. In this way the

broken ends were held in place until the joint had been flexed. In place of hyper-flexion one may put the hand up in hyper-extension. We have the authority of W. W. Keen and of Robert Jones for it that this method is fraught with much greater danger of ankylosis to the patient.

THE FOREARM.

In children because of the presence of a strong periosteal hinge it is frequently possible, even when both bones are broken, to straighten the arm and obtain ideal alignment and apposition. In adults, on the other hand, in the presence of fracture of both bones, ideal apposition and alignment frequently cannot be obtained without resort to open operation. In that event it is usually the fragments of the radius which resist replacement. For some unexplained reason attempts at plating this bone are frequently followed by delayed union. It is advisable therefore to adjust the fracture and then close the wound and apply an external splint rather than to employ an internal splint.

When the attempt is made to set the fracture by manipulation, the anatomical facts must be borne in mind that the ulna is straight and subcutaneous throughout its length, whereas the radius curves about it. Therefore anterior and posterior valve-shaped splints should be so applied that the ulna is supported throughout its length, while no pressure at all is made on the middle of the shaft of the radius. The anterior and posterior valves are united by adhesive straps at wrist and elbow.

Splinting for fracture involving a single bone of the forearm constitutes an exception to the rule for employing valve-shaped splints. In this case the forearm is placed in supination since in that position the shafts of the two bones are most widely separated, and anterior and posterior board splints applied. These splints must be wider than the arm. The anterior extends from the flexure of the elbow to the middle of the palm where a roller bandage is strapped to it to enable the fingers to curl around it. The posterior board extends from the point of the elbow to the wrist. Both boards are suitably padded and then fitted in place by three adhesive straps, one at either end and one in the middle. Here advantage is taken of the fact that a flat board will touch a cylindrical limb only along a single line to force the anterior and posterior muscle bellies into the interval between the two bones, thus crowding them apart, avoiding the danger of malunion and indirectly fixing the fragments of the broken bone. The adhesive straps can be drawn tight without danger to the circulation so long as the boards are wider transversely than the patient's arm.

The essentials to be borne in mind in treating Colles' fracture are:

- 1, That there shall be a true and complete reduction of the deformity;
- 2, That the fingers shall be left free from the first and motion of them encouraged;
- 3, That passive motion at the wrist should be avoided while the callus is soft and sensitive.

If reduction is complete almost any one of the

many splints devised for the purpose will maintain it. Massage, gentle at first, should be begun early and should be vigorous by the end of the third week. When the splints are removed the wrist should be supported by circular adhesive strapping for the space of three inches. The danger with Colles' fracture is that there will be too much and too long splinting.

THE CARPUS.

Only fracture of the carpal scaphoid deserves special mention here. There is noticed stiffening and weakness of the fingers. It is found that there is inability to dorsiflex the wrist and there is an area of acute sensitiveness to pressure in the "anatomical snuffbox."

The indication for treatment is to dorsiflex the wrist and immobilize. If a displaced fragment of the bone prevents this, try to press it back into place and then dorsiflex. If this is not successful cut down on the fragment, remove it and then dorsiflex.

Immobilize on an anterior splint so constructed as to maintain dorsiflexion and permit of free motion of the fingers.

FRACTURES OF THE LOWER EXTREMITY.

Fractures of the femoral neck. It should be borne in mind that a so-called traumatic coxa vara, or bending of the femoral neck, is the most frequent sequel following upon an "intra capsular fracture." The functional consequences of such a change are marked limitation of abduction and great added strain to the weakened bone. Treatment should be directed toward preventing the occurrence of this traumatic coxa vara by maintaining, if it be present, or reconstituting, if it be diminished, the normal angle made by the femoral neck with the shaft.

Recalling in this relation the fundamental principle underlying the treatment of all fractures near joints, namely, that the parts shall be immobilized in the extreme of that motion which is ordinarily most difficult of attainment, it becomes at once apparent that the limb should be immobilized in maximum abduction. To do this proceed as follows: Anesthetize the patient and place upon the sacral support ready for applying plaster of paris. Abduct the sound limb to the limit of motion. Next, supporting the affected limb, carefully abduct it, using gentle but positive force, till it makes an angle with the body equal to that made by its fellow.

Maintaining these positions apply plaster of paris in a double spica from the toes to the axillae. Reinforce it by a stick extending from one foot to the other, its ends being incorporated in the plaster of paris splint. In this way the fragments of the femoral neck are both pressed together and their alignment assured by the integrity of the pubo-femoral ligament which by this manoeuvre is made tense.

Where because of threatened hypostatic pneumonia, or for other cause, it is not expedient to keep the patient lying down the same result may

be sought in the following way first advocated by Dr. Maxwell of Keokuk, Iowa:

1. Make a 25-pound pulley traction downward in the direction of the limb, and 2, a 15-pound pull obliquely upward and outward over the side of the bed. The resultant diagonal of force of these two tractions will be represented by a pull in the direction of the femoral neck. In this way the capsule is drawn out as a tense sleeve about the fractured ends, maintaining them in proper alignment.

After applying this dressing the patient may be sat up in bed without disturbing the setting.

The writer has used this method successfully in the case of an old lady 89 years of age.

FRACTURES OF THE SHAFT OF THE FEMUR.

These are best conservatively treated by constant traction as expositied in the Thomas bed brace. This consists of a padded ring which encircles the thigh and from which depend two metal rods which meet ten or twelve inches below the patient's foot. The ring is crowded upward against the patient's perineum and ischial tuberosity while a steady unremitting pull is made on the limb by adhesive or other form of tractions, the lower or free ends of which are attached to the bottom of the splint.

Sheath splints of plaster of paris or of sheet iron properly padded then extend posteriorly from gluteal fold to lower third of leg, and anteriorly from groin to above patella. They are swung between the uprights of the splint by means of slings of bandage material. As muscle spasm relaxes the tractions become loose and have to be taken up. The nurse or attendant must be instructed to wipe the ring from time to time with a soapy rag and to move the skin under it every two hours for the first day or two that it is worn.

When there is shortening it may be pulled out under deep anesthesia, using a watch tackle, that is, strong pulleys, until the leg is as long as its fellow, and then all the lengthening so gained must be maintained by applying the splint just described.

After six weeks the patient may be got up, wearing a walking caliper made from the same splint by cutting it one-fourth inch too long for the leg and fitting the ends into round sockets in the sole of the shoe just in front of the heel. In this way the patient's heel is kept off the ground and he has the advantage of exercise while still unable to put his weight on his injured limb.

The same apparatus may be used in treating fractures of the upper three-fourths of the tibia and fibula. Fractures involving both bones in the lower third of the leg are exceedingly intractable. They are best treated by open operation.

Because of the frequency with which nonunion occurs in this region it is well to see after doing an operative reposition whether the fractured ends will not remain engaged firmly enough to permit of the application of a cast without the introduction of an internal splint.

POTTS' FRACTURE.

It is not my intention now to discuss the causation nor the pathology of Potts' fracture beyond saying that there is a break of the fibula

some distance above the joint, while the tibia may have sustained any one of several injuries all resulting in the same thing, namely, a break or tear of that portion of it to which are attached the internal lateral ligaments of the ankle joint. There is sometimes also a tearing loose of the anterior border of the lower end of the tibia with a dropping down of the fragment. Unless sought for and corrected when present this last named derangement, by interfering with dorsal flexion, will nullify what would otherwise have been a perfect result.

The deformity consequent upon these derangements is a displacement outward of the foot on the leg. Further, there is usually a displacement backward of the foot on the leg. When this occurs you will notice that the anterior articular edge of the tibia, that is, its lower border in front, is unduly prominent. Occasionally the foot is displaced forward. But this derangement is rare. What now is our mechanical problem and how are we going to meet it?

The problem is to straighten out the overlapping in the fractured fibula at the outer side of the leg, to bring the torn ends of the tibia at the inner side of the ankle into closest apposition, to reduce the subluxation usually backward (though sometimes forward) of the foot on the leg and—remembering our rule—to immobilize the joint in that position which it finds most difficult to assume.

Assuming that I have to do with the usual form of Potts' fracture—that in which the foot is dislocated backward on the leg—I proceed as follows: An ordinary kitchen roller towel is passed around the leg opposite the lower end of the tibia. I place my foot in the loop of this towel. In this way the limb is definitely anchored at a given distance from the floor.

Next, a second roller towel is passed around my shoulders and behind the patient's heel. You will at once perceive that by merely straightening my body I shall be able, whenever I wish to do so, to exert a tremendous forward pull on the backwardly dislocated foot. At the same time my hands are free to guide the foot during the manipulation.

Now the superior articular surface of the astragalus is narrowest at its posterior part; a fact of which we should take advantage in our efforts at reduction.

The following is my actual maneuver:

1. Place my roller towels about the member in the manner indicated.

2. Flex the knee and thereby relax the pull of the tendo Achilles.

3. Grasping the foot with the hands pull it down into full plantar flexion. This will bring the narrowest part of my astragalus into the tibio-fibular mortice.

4. While maintaining plantar flexion I straighten my body. This will cause the roller towels to make the foot to skid forward upon the narrow posterior superior articular surface of the astragalus. And the subluxation backward is seen to be overcome.

5. Still maintaining the knee flexed carry the foot into full dorsal flexion. In this way, should an anterior fragment of the lower end of tibia have dropped down it will be forced back into place.

6. Without losing any dorsal flexion, the whole foot is turned or twisted inward to the limit of supination.

7. While maintaining the posture obtained by the preceding maneuver, a thick layer of cotton wadding is applied, and over it a plaster of paris cast. Correction is maintained while the plaster is setting.

8. As soon as the plaster has set firmly it is good surgery to split the cast throughout its length. I do this not for the reason set down in the textbooks, namely, fear of gangrene, but because I believe that in the course of our studies of the cause and treatment of ununited fractures swelling has been definitely proven to be an important factor in the normal process of repair of bone.

Your patient may be got up on crutches and wearing his cast in three weeks. At this time the cast may be so loose that you will have to renew it without, however, altering the position of your foot.

At the end of six weeks you can have the inner side of the sole and heel of his shoe raised one-fourth inch and flanged inward, and the shank of shoe blocked solid.

If the patient be heavy, an outside leg iron, working in a round socket just in front of the heel, should be supplied. A strap about the ankle pulls the foot over toward this leg iron and into a position of supination. This shoe, or shoe and iron, should be worn for three or four months longer.

If this precaution is not taken what at first appears to be a good result will gradually, through stretching of the soft callus, be transformed into a painful pronated foot.

Though not germane to the general heading of this paper, fractures of the heel would appear to be so common among industrial accidents that a note concerning them is appended here.

The treatment given those fractures of the heel which have come before me for review has invariably failed to prevent a crippling deformity.

The cause of such fractures is a fall from a height where the patient lands squarely on his feet in a standing position.

The lesion is a crushing of the os calcis, usually with involvement of the sub-astragaloid joint and sometimes of the astragalus. It may be so severe that if the bone is cut down upon the fragments will resemble a bag of pebbles. In appearance the heel is widened from side to side and shortened from above downward.

Manifestly the worst possible treatment would be prolonged immobilization in full dorsal flexion. Extreme dorsal flexion being always associated with abduction. But this would seem to be precisely the treatment usually employed.

The object of appropriate treatment is to return the os calcis to its original shape and to re-establish normal motion in the sub-astragaloid joint.

This can be attempted in the following way:

(1) Relax the pressure on the heel by plantar flexing the foot, and maintain this plantar flexion to the end of treatment.

(2) Pull the heel down by passing a sound from side to side in front of the Achilles tendon and making traction upon it. Make sure of pronation and supination by rocking it from side to side to the limits of normal motion while making traction.

(3) Place the foot on its side on a sand sac and with a padded hammer impact the fragment.

(4) Immobilize in a plaster of paris dressing, the foot being still in plantar flexion.

(5) In a few days, and never later than after two weeks, begin with gentle passive motion in the sense of supination and pronation.

(6) Keep off the foot for three months and resume walking while wearing an appropriate arch support.

As in all fracture work proper massage will hasten recovery.

The foregoing is an outline of the way in which your orthopedist, who is primarily a bone surgeon, views fresh fractures of the long bones and of the principles upon which he bases his treatment.

SOCIETY REPORTS

MARIN COUNTY,

Marin County Medical Society met on Thursday evening, May 12, at the home of Dr. E. J. Hund in San Anselmo. The paper of the evening was by Dr. R. L. Ochsner, on the early diagnosis of tuberculosis. The paper received much discussion.

Among those present were Drs. S. M. Augustine, J. P. Crawford, H. O. Howitt, E. J. Hund, H. O. Hund, W. F. Jones, L. L. Stanley, C. A. Flannagan and E. W. Alexander.

At the close of the meeting refreshments were served.

Respectfully submitted.

O. P. STOWE, Sec.

PLACER COUNTY.

The Placer County Medical Society held its regular meeting in Auburn, Saturday evening, March 25th. Through the courtesy of the Trustees of the Placer Union High School, the Assembly Hall of that building was used as a place of meeting.

The March meeting was a Public Health meeting, and for this reason a special invitation was sent to each member of the local Boards of Health of Placer County, inviting an attendance at the meeting.

Doctor James G. Cumming, director of the Bureau of Communicable Diseases of the State Board of Health, read a paper entitled "The Protection of Public Water Supplies with Special Reference to Dysentery and Typhoid Fever." Professor W. B. Herms, of the University of California, who has charge of the special work to be done by the State Board of Health in its campaign against malaria, gave an address illustrated by lantern slides, on "Practical Aspects of Malaria Control."

These papers were discussed by members of the society and visitors.

It is expected that the next meeting will be held in Roseville.

ROBERT A. PEERS, M. D.,
Secretary.

MENDOCINO COUNTY MEDICAL SOCIETY.

At the call of the president, Dr. L. C. Gregory, a meeting of the Mendocino County Medical Society was held at Hotel Cecille, Ukiah, on the evening of the 3d of June.

Invitations to be present had been extended to all